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ABSTRACT

The present study examined the spontaneous private speech of 16 children of 5 to 7 years of age whose documented birth weight was below 1500 grams and who showed evidence, at the time of testing, of behavioral and learning difficulties. Children in the sample, though of normal intelligence, showed depressed early reading skills, difficulties in visual-motor integration and some evidence of attention-deficit symptomatology. Three hypotheses were tested regarding possible deficits in the production, quality and internalization of self-regulatory language in this high-risk sample. The findings suggest that although the overt self-regulatory private speech of high-risk children is apparently normal, their marked lack of whispering indicates difficulties in the subvocalization or internalization of such speech. A strong relation was found between lack of whispering and an index of reading disability, suggesting that the capacity to internalize speech might be a necessary precursor for the capacity to read. Thirty-eight references are included. Four statistical tables and four graphs are presented to support the study. (Author/RH)

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The Private Speech of Young Children At Risk: A Test of Three Deficit Hypotheses

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Abstract

The present study examined the spontaneous private speech of sixteen children ages 5-7 whose documented birth weight was below 1500 grams and who showed evidence, at time of testing, of behavioral and learning difficulties. Children in the sample, though of normal intelligence, showed depressed early reading skills, difficulties in visual-motor integration and some evidence of attention-deficit symptomatology. Three hypotheses were tested regarding possible deficits in the production, quality and internalization of self-regulatory language in this high-risk sample. The findings suggest that although the overt self-regulatory private speech of high-risk children is apparently normal, their marked lack of whispering indicate difficulties in the subvocalization or internalization of such speech. A strong relation was found between lack of whispering and an index of reading disability, suggesting that the capacity to internalize speech might be a necessary precursor for the capacity to read.

The Private Speech of Young Children At Risk: A Test of Three Deficit Hypotheses

According to Soviet developmental theory (Luria 1981; Vygotsky, 1962), young children use language not only to communicate but also to plan, guide and monitor their behavior in a self-regulatory fashion. Such self-regulatory language, commonly labeled "private speech", emerges shortly after the onset of communicative or social speech. The production of private speech increases with age, peaking around ages four or five and gradually diminishing until its eventual disappearance about the ages of seven or eight. According to both Luria and Vygotsky, private speech does not totally disappear with age, but rather it becomes subvocal ("goes underground") to constitute inner speech or verbal thought. Such internalized speech becomes the basic core of verbal self-regulation and verbal mediation characteristic of adult cognition and behavior. Current empirical research in the U.S. has given substantial support to the above formulations and has documented the self-regulatory functions of preschoolers' private speech (see e.g., Berk, 1985; Berk & Garvin, 1984; Diaz, 1984; Frauenglass & Diaz, 1985; Zivin, 1979).

Consistent with Soviet theory of verbal self-regulation, children with a wide range of behavior and learning difficulties (e.g., aggressiveness, impulsivity,

hyperactivity and learning disabilities) show deficits in different aspects of private speech and verbal mediation. A study by Camp (1977), for example, found that one of the strongest variables differentiating normal from highly aggressive boys was immature and task-irrelevant private speech. In a different study, Copeland (1979) found similar results when comparing the private speech of hyperactive and normal boys in a free-play situation. Several training studies (Graybill, Jamison & Swerdlik, 1984; Meichenbaum & Goodman, 1979; Palkes, Stuart & Kahana, 1968) show that training impulsive and hyperactive children to talk to themselves resulted in more reflective and more accurate performance, suggesting a possible lack of spontaneous self-regulatory speech in these troubled children. Furthermore, investigators such as Miller & Rohr (1980) have suggested that the perceptual and conceptual problems of learning disabled children might be based on more basic deficits in verbal mediational processes.

At present, it is not clear what specific deficits in verbal self-regulation and verbal mediation might predict specific behavior and learning problems. Nonetheless, the literature suggests three possible sources of difficulty. First, as Meichenbaum's and other training studies suggest, behavior problems might occur when children fail to produce slef-regulatory speech in the appropriate situations. This first possibility could be labeled the <u>production-deficit</u> hypothesis. Second, as the work of Camp (1977) and Copeland

(1979) suggests, problems in self-regulation might result from the low quality of a child's private speech utterances. That is, self-regulatory deficits might occur when children emit utterances that are irrelevant to the task or basically immature in content, reflecting emotions and word play rather than guiding, organizing and planning functions. This second possibility could be labeled the quality-deficit hypothesis. Finally, as suggested by Miller & Rohr (1980), learning and behavior problems might result from the inability to use covert verbal mediation, suggesting difficulties, not necessarily in the quantity or quality of private speech, but rather in the subvocalization or internalization of such speech. This third possibility could be labeled the internalization-deficit hypothesis.

A major problem in identifying specific deficits in the verbal self-regulation of behavior-disordered and learning-disabled children is the fact that most learning and behavioral diagnoses are made after the beginning of formal schooling. At that time, as developmental theory states, it is too late to examine openly the onset, development and internalization of private speech, a process that is accessible to empirical observation mostly during the preschool years. This problem is not hopeless, however. Some children, like very low birth weight (VLBW) children, are born at high risk for a wide range of learning and behavior problems (Drillien, 1972; Sell, 1983). VLBW children of a preschool age offer a unique opportunity to

study the development of verbal self-regulation in children who have or will most likely develop different behavior and learning difficulties. The present study, therefore, was designed to study the appropriate production, quality and internalization of self-regulatory speech in a sample of VLBW preschoolers in order to examine the validity of the three deficit hypotheses outlined above.

The production-deficit hypothesis states that self-regulatory problems might result from a failure to produce private speech appropriately. In order to test this hypothesis, two choices were considered. The first choice was to compare the amount of private speech emitted by VLBW and normal children in a problem-solving situation. This choice presented several problems, including making the groups equivalent on a number of relevant variables. In addition, in normal children there are large individual variations in the amount of private speech produced (Frauenglass & Diaz, 1985). The sources of such individual differences in the production of private speech are largely unknown and, therefore, between-group comparisons or comparisons among individuals in the amount of private speech produced might be seriously misleading. The second choice was to examine the amount of self-regulatory private speech produced by VLBW children in relation to task-difficulty (a within-subject comparison). One of the central characteristics of normal children's private speech is that it increases with tasks of increasing difficulty,

suggesting that normal children appropriately bring language to the problem-solving situation in order to cope with the increasing demands of a given task (Goodman, 1981). A comparison of the amount of private speech emitted by VLBW children in easy vs. difficult task was then chosen as the stricter test of the first hypothesis. In this comparison, issues regarding individual differences in the production of private speech are dealt with by allowing individual subjects act as their own control.

The quality-deficit hypothesis states that self-regulatory problems might stem from the immature or irrelevant content of private speech verbalizations. In one of the earliest studies of private speech in the U.S, Kohlberg, Yaeger & Hjertholm (1968) suggested that private speech utterances could be categorized in a hierarchical-developmental fashion, with word play, task-irrelevant statements and emotional expressions at the lowest immature level, and guiding, planning and orienting task-relevant utterances at the highest developmentally-advanced levels. In three different studies (Camp, 1977; Copeland, 1979; Meichenbaum, 1975) involving aggressive, impulsive and hyperactive children, the content of their private speech was categorized mostly as immature and task-irrelevant. A major problem in interpreting these findings is the fact that, in most cases, private speech was elicited in free-play situations or in a testing situation involving standardized nonverbal tests administered by an

experimenter. As the recent literature suggests (see e.g., Berk & Garvin, 1984; Frauenglass & Diaz, 1985), free play and nonverbal tasks are not the most appropriate contexts to elicit and examine the quality of children's private speech. Private speech is more appropriately assessed in goal-oriented situations involving semantic tasks where the use of language can facilitate achieving a solution. In the present study, the quality-deficit hypothesis was tested in a structured problem-solving situation involving both semantic (classification and story-sequencing tasks) and perceptual (puzzles) tasks. If this hypothesis is true, we should expect a significantly greater amount of task-irrelevant than task-relevant speech in this high-risk population.

Finally, the internalization-deficit hypothesis suggests that failure to internalize private speech will result in a lack of covert verbal mediation and this, in turn, is responsible for a wide range of perceptual and conceptual difficulties in learning-disabled children. As both Vygotsky and Luria formulated, private speech does not disappear with age but is internalized to constitute inner speech or verbal thinking. According to Soviet theory, then, private speech is the precursor of the capacity for covert verbal mediation. Two sets of empirical data have given support to Soviet formulations. First, studies of mediated memory show an increased reliance with age in the use of spontaneous covert verbal rehearsal and verbal

mediation (Conrad, 1971; Flavell, 1970). Second, private speech studies show that as the amount of self-regulatory speech declines with age, there is an increase in whispers and mutterings suggesting a process of subvocalization or internalization of such speech. Figure 1 portrays such interaction between private speech and whispers obtained in a recent study done with normal children by the senior author. In the present study, the internalization-deficit hypothesis was tested by examining the pattern of interaction between private speech and whispers in VLBW children of different mental age.

Insert Figure 1 about here

Method

Subjects

Sixteen children (mean age = 70.2 mos.; range 60-82 mos.) were randomly selected from a larger sample of subjects who are participating in a longitudinal study on the development of very low birth weight (VLBW) children. All children in the sample weighted less than 1500 grams at birth. Very low birth weight was chosen as the risk factor because of consistent reports in the literature that children of such low birth weight show a wide range of neuropsychological deficits and are at high risk for a number of behavior and learning problems.

Subjects in the study ranged in gestational age from 27-32 weeks, with a mean of 30.9 weeks. Birth weights ranged from 850-1460 grams, with a mean of 1147.2 grams. All children in the sample were diagnosed at birth to have respiratory distress syndrome and received varying degrees of ventilatory and oxygen therapy. The sample was characterized by the following demographic variables: seven females and nine males; seven Hispanic-Americans and nine of Anglo-Saxon origin, all native speakers of English; three children were attending first grade, ten were attending Kindergarten classes while the other three were either in preschool or no formal school program; ten children came from middle-class homes while six belonged to families classified as lower class or poor homes according to the Hollingshead scale.

Measures

Cognitive Tasks. Children were asked to complete three different types of tasks: 1) classification of familiar objects, 2) sequencing of pictures portraying simple stories and 3) puzzles. The different pieces of the puzzles had straight edges and, therefore, internal picture cues had to be utilized in order to complete the task successfully. The three tasks were administered in random order and, before each one, appropriate instructions and examples were given. Children were then asked to work by themselves for a period of five minutes on each task, and do as many items as they could within such time period. The

classification task was scored by counting the number of pairs correctly classified together. The sequencing task was scored by counting the number of figure pairs that were correctly sequenced . Finally, the puzzles task was scored by counting the number of pieces correctly joined within each puzzle. Children were videotaped while performing the three different tasks.

Speech Categories. Children verbalizations during the cognitive tasks were transcribed from the videotapes and coded into mutually exclusive and exhaustive categories. A speech unit was defined as a sentence, phrase or any segment of speech separated from other speech by three or more seconds. Each speech unit was assigned to one of the following categories (adapted from Frauenglass & Diaz, 1985):

1. Social speech. All speech directed to the experimenter, either task-relevant or not. Also, any speech accompanied or immediately followed or preceded by a gaze towards the experimenter.

2. Private speech. All speech not coded as social was assigned to one of the following categories:

A. Task-Relevant. This category included utterances directly related to the task such as labeling and describing the materials, verbalization of plans and goals, questions and answers to the self about the task, and utterances that served as transitional statements between the task items.

B. Task-irrelevant. This category included word play, emotional expressions and other task-irrelevant comments.

C. Whispers. This category included whispers, mutterings or inaudible speech as evidenced by lip movements.

Reliabilities ranging from 91% to 95% agreement between independent judges have been obtained for this coding system (see Diaz, 1984; Frauenglass & Diaz, 1985).

Cognitive, Visual Motor and Reading Assessments. The children were administered the McCarthy Scale of Children's Abilities (McCarthy), the Test of Early Reading Ability (TERA) and the Developmental Test of Visual Motor Integration (VMI). The McCarthy test (McCarthy, 1972) is a standardized measure of overall cognitive ability that includes verbal, perceptual, quantitative, memory and motor measures. The measure's validity and reliability have been well-documented (see e.g., Salvia & Ysseldyke, 1981) and is especially suited for preschool populations. The TERA (Reid, Heresko & Hammil, 1981) is a valid, reliable and standardized measure, designed to assess early reading skills generally acquired in preschool through first grade. The test measures skills related to alphabet recognition and use, awareness of print in the environment, comprehension of stories read aloud and the ability to find meaning in print. Among other things, the TERA provides a good indication of

children's knowledge of and ability to recite the alphabet. The VMI (Beery & Buktenica, 1967) is anc ther standardized test that measures visual-motor integration by asking children to copy up to 24 geometric designs of increasing difficulty. Both the VMI and TERA seem good predictors of children's early reading abilities. For example, Satz, Taylor, Friel & Fletcher (1978) found that problems in visual-motor coordination and the inability to recite the alphabet are two of the three most important factors associated with early reading difficulties.

Behavioral Assessment. Parents of children in the sample were asked to complete the Conners Parent Symptom Questionnaire (Conners). The scale was designed to measure five different behavior domains that are usually problematic for children with conduct and learning problems. The Conners provides a rating of severity for children's conduct and learning problems, psychosomatic symptoms, impulsive-hyperactive behavior and anxiety (Conners, 1970, 1973). Parents ratings indicate whether a given behavior occurs and how severely in a scale ranging from "not at all" to "very much."

Procedure

Sixteen children, ages 5-7 and who are considered high-risk on account having a documented birth weight of less than 1500 grams, were selected from a larger sample of children born VLBW, who are currently participating in a longitudinal study. Children were interviewed individually

in two different sessions. During the first session, children were administered the McCarthy, TERA and VMI tests. Also, at this time, their parents filled out the Conners rating scale. During a second session, within 1-2 weeks, children were videotaped while performing three cognitive tasks: classification, story sequencing and puzzles. The tasks were administered in a random order and, before each task, children were adequately instructed with examples. Children were told to work on their own for a period of five minutes for each task until the sound of a bell. Each task contained from 10-12 different items that were practically impossible to finish within the specified time period. Children were also told to do as many items as they could and that they would receieve a candy reward for their efforts. While the children were working on their own, the experimenter (a research assistant different from the person who administered the standardized tests) sat five feet away with his back towards the child and engaged in some paperwork. This situation, with the experimenter present but somewhat detached from the child's ongoing activity, has been shown to be a good situation to elicit self-regulatory private speech (Frauenglass & Diaz, 1985). Children received a candy reward at the completion of the last task. At a later point in time, children's verbalizations during the tasks were transcribed from the videotapes and coded into the different speech categories.

Results

Cognitive and Behavioral Description

Table 1 reports individual scores, means and standard deviations for the McCarthy, TERA, VMI and Conner measures. The table also reports information about children's whispering during the task that will be explained and discussed below under a different heading. As can be seen from the table, children in the group are of normal intelligence, with a mean McCarthy General Cognitive Index of 99.6 . As expected, however, the sample shows serious deficits with respect to visual motor integration, early skills and hyperactive behavior. Half of the sample scored at the 21st percentile or below in the VMI. Ten subjects (or 62%) were classified as reading disabled, by comparing their McCarthy General Cognitive Index (GCI) with their TERA Reading Quotient (RDQ). A reading disability was defined as GCI-RDQ > 20. Five subjects (or 31%) were classified as hyperactive on account of their Conners scores > 15. In sum, thirteen (or 81%) of the children in the sample were classified as reading disabled, hyperactive or both. The data from the cognitive and behavioral measures confirm that this sample is a high-risk group for learning and behavioral problems.

Insert Table 1 about here

The Production- and Quality-Deficit Hypotheses

In order to test the first two hypotheses, the four categories of speech (social, task-relevant, task-irrelevant and whispers) were collapsed into two different levels: 1) High-Level Speech (HLS) included task-relevant verbalizations and whispers, 2) Low-Level Speech (LLS) included task-irrelevant and social speech. The quality-deficit hypothesis was reformulated in the following way: VLBW children will produce a higher number of low-level, task-irrelevant speech (LLS) than higher-level, task-relevant (HLS) verbalizations. The production-deficit hypothesis was restated in the following way: There will be no relationship between VLBW children's task-relevant private speech and task difficulty. That is, the HLS of these children will not increase, as it should, in a more difficult task.

Task difficulty was determined by the percent of correct items obtained in the tasks. Story sequencing was determined to be the difficult task (59 % correct) and the classification task was determined to be the easy task (87 % correct). The puzzles task, a perceptual type of task, was truly the most difficult task for this sample (48 % correct), but was not included in this analysis because of its lack of comparability to semantic types of task in terms of eliciting private speech (see Frauenglass & Diaz, 1985).

The quality-deficit and the production-deficit hypotheses were then tested in a single repeated-measures analysis of variance: a 2 x 2 ANOVA with factors SPEECH TYPE (High Level vs. Low Level) and TASK DIFFICULTY (Easy-classification vs. Difficult-sequencing), where both factors were within-subjects factors, and the number of utterances produced was the dependent variable.

Insert Table 2 about here

Table 2 reports mean number of utterances and standard deviations for both speech levels and task difficulty. A significant main effect was obtained for speech type, $F(1,15)= 8.17$, $p < .01$, indicating that VLBW children emit a significant higher number of High Level private speech (HLS) than Low Level Speech (LLS). No significant main effect was found for task difficulty, although there was a substantial trend indicating more verbalizations in the more difficult task, $F(1,15)=2.31$, $p < .15$. A marginally significant speech level by task difficulty interaction was obtained, $F(1,15)=3.80$, $p < .07$, indicating that VLBW children emit more HLS and less LLS in the more difficult task. As the means reported in Table 2 show, children in the sample produced almost four times more HLS in the difficult than in the easy task. The fact that this interaction did not achieve statistical significance is probably due to the large individual variations (as evidenced by the large

standard deviations within each cell) that tend to minimize the size of the F values in the analysis. Figure 2 portrays a visual representation of this interaction.

Insert Figure 2 about here

It is clear from these results that neither the production-deficit nor the quality-deficit hypotheses are supported by the data. On the contrary, the private speech of VLBW children, so far, appears to behave as the private speech of normal children.

The Internalization Hypothesis

The third hypothesis states that self-regulation deficits of problem children might stem from difficulties in the internalization of private speech, resulting in a lack of self-regulatory inner speech and the inability to use covert verbal mediation. In studies of normal children, the internalization of private speech is evidenced by an increase in whispers and mutterings and a decline in overt task-relevant speech with increasing age. An example of such interaction between task-relevant speech and whispers is portrayed in Figure 1. The internalization-deficit hypothesis predicts that VLBW children would show 1) a minimal use of whispers, if any at all, and 2) no interaction between task-relevant speech and whispers with increasing age.

In order to test this hypothesis, the sample was divided into three groups of increasing mental age. Mental age (MA), rather than chronological age, was used as a better index of children's cognitive and maturational level (see Frauenglass & Diaz, 1985). The following MA groups were formed: Group 1, n=6, mean MA = 59.0; Group 2, n=5, mean MA= 72.0 ; Group 3, n=5, mean MA= 84.4. Table 3 reports the mean number of utterances, standard deviations and corresponding percentages for each category of speech by mental age groups.

Insert table 3 about here

Overall, the data lend support to the internalization-deficit hypothesis, on three different counts. First, the number of whispers emitted by VLBW children is relatively low: only 10.1 % of all recorded utterances were coded as whispers, as compared to 44.5 % (in Frauenglass & Diaz, 1985), to 48 % (in Gaskill, 1985) and 47 % (in Diaz & Padilla, 1985) in the private speech protocols of normal children within the same age range. Second, rather than increasing with increasing age, as found in the samples of normal preschoolers, the number of whispers produced by VLBW children <u>decline</u> with increasing age. Finally, the interaction between task-relevant private speech and whispers observed in normal preschoolers can not be found in the data of VLBW children.

It should be noted that there is an increase in the percentage of whispers from groups 2 to 3 (7 % - 22 %) while there is a decrease in the percentage of task-relevant speech for the same groups (88 % - 76 %). It is possible that these changes with age represent the beginnings of a private speech-whispers interaction or subvocalization process, a possibility that cannot be determined from the present data. If this is the case, the data suggest not a complete lack of internalization of private speech, but rather a gross delay in the subvocalization process. Figures 3 and 4 graph the relation between the mean number of utterances and percentage of utterances for the four categories of speech with increasing mental age.

Insert Figures 3 and 4 about here

Low vs. High Whispers Children

Since the data suggest a potential deficit in the internalization of private speech, as evidenced by a low number of whispers and no clear private speech-whispers interaction with age, it seemed important to investigate whether a lack of whispering predicts cognitive and behavior difficulties. In order to investigate this possibility, the sample was divided into two groups of High and Low whispers with a median-split according to the number of whispers emitted. Table 4 reports means and standard deviations for

the McCarthy, TERA, VMI and Conners scales for High Whispers (HW) versus Low Whispers (LW) groups.

Insert Table 4 about here

The two groups are significantly different only on their TERA scores, suggesting a possible relation between the lack of internalized speech and future reading difficulties. This relation between whispering and early reading skills appears much stronger when the data presented in Table 1 is closely examined. Seven out of eight children (or 87.5%) of the LW group were classified as reading disabled as compared to only three out of eight (or 37.5 %) in the HW group. Examining the data from a different perspective, 70 % of reading disabled children in the sample were classified as having a low number of whispers.

Low and high whispers groups are also different on their VMI scores, although the difference failed to reach the prespecified level of statistical significance. This trend, as well as the obtained positive correlation between VMI and TERA scores ($r = .57$, $p < .01$), support recent findings on the relation between perceptual-motor development and reading readiness in preschoolers (Solan, Mozlin & Rumpf, 1985).

Discussion

The results of the present investigation suggest that the overt self-regulatory speech of high-risk young children is similar to the private speech observed in their normal peers, on two different counts. First, in a structured task-situation, high-risk children of a preschool age produced significantly more task-relevant than task-irrelevant private speech. Second, their task-relevant speech increased appropriately in tasks of greater difficulty. These data did not support the production- nor the quality-deficit hypotheses, as formulated in the study.

On the other hand, three additional findings suggest some difficulties in the internalization of private speech for the children in the sample. First, the percentage of whispers emitted by these children was relatively very low (10 %), when compared to the percentage of whispers emitted by normal children of a similar age range (about 50 %). Second, the absolute number of whispers emitted decreased with increasing mental age, in contrast to the increase with age found in the speech protocols of normal children. And third, the interaction between task-relevant speech and whispers as a function of age, observed in normal children, was not evident for this high-risk sample. These three observations lend support to (and would be predicted by) the internalization-deficit hypothesis.

The marked lack of whispering observed in these children could be interpreted in three different ways. One possibility is that, on account of prenatal and perinatal

risk factors, these children have serious deficits in the neurological integration needed for the internalization of speech (Milner, 1976). Another possible interpretation is that the expected internalization of self-regulatory language has not yet occurred and is, therefore, grossly delayed in this population. Finally, it is possible that, because of the regulatory functions of the acoustic and physical properties of speech (Luria, 1961, 1982), these children rely more heavily on "talking aloud" in order to compensate for the attentional, perceptual, or behavioral difficulties they suffer from. Obviously, more research is needed to understand and test the validity of the three alternative explanations.

The findings from the present study have some serious implications for studies that train impulsive, hyperactive and learning disabled children with self-instructional strategies (see e.g., Friedling & O'Leary, 1979; Graybill, Jamison & Swerdlik, 1984; Kendall & Braswell, 1985; Meichenbaum & Goodman, 1971). Overall, self-instructional training studies with high-risk and other problem children have been successful in improving children's task performance during the experimental sessions. The effects of the training to talk aloud, however, have failed to generalize to the classroom or to other situations outside the training sessions. The data from the present study suggest that an immature or a lack of overt private speech is probably not the source of the problems that these

vulnerable children experience, so perhaps researchers have been training a skill that these children already have. If the real problem is the internalization of self-regulatory speech, it is not surprising that the effects of the training disappear when children go back to the classroom or to other work situations where talking aloud is not permitted or considered socially inappropriate.

The strong relation found between a lack of whispering and depressed early reading scores deserve further attention. Even though the skills involved in reading and the nature of reading disabilities are subjects of much debate (see e.g., Crowder, 1984), it is possible that the capacity for internalized speech is a precursor of the capacity to read. In fact, the inability to use internal speech could very well be a parsimonius explanation to account for some information-processing deficits observed in both dyslexics and poor readers, such as the inability to maintain a phonetic code for short term memory (Mann, 1984) or the inability to deal with stimuli in an analytic fashion (Wolford & Fowler, 1984). It is interesting to note that the strongest correlation ever reported in the private speech literature between the use of private speech and cognitive performance, is Pechman's (1978) obtained .87 correlation between the amount of private speech used in the classroom and later reading achievement.

We would like to conclude by recognizing some limitations of the present study. The number of children in

the sample is admittedly small, and the group is not homogeneous with respect to the difficulties and vulnerabilities they present. The relation between whispering, internalized speech and reading disabilities, should be considered with caution for two major reasons. First, further research is needed in order to validate whispers as a sign of subvocalization and internalization of private speech. And second, the TERA is a measure of pre-reading skills and not a measure of actual reading ability; most likely the test measures also some skills that are not directly involved in the reading process. Nonetheless, regardless of the above limitations, we believe that the findings from the present study offer new and exciting perspectives in the understanding of self-regulation, pre-reading skills, and the possible sources of learning and behavioral deficits in high-risk populations.

References

Beery, K.E. & Buktenica, N. (1967) Developmental Test of Visual Motor Integration. Illinois: Follet Publication.

Berk, L.E. (1985) Why Children Talk to Themselves. Young Children, July 1985.

Berk, L.E. & Garvin, R.A. (1984) Development of private speech among low income Appalachian children. Developmental Psychology, 20, 271-286.

Camp, B. (1977) Verbal Mediation in young aggressive boys. Journal of Abnormal Psychology, 86, 145-153.

Conners, C.K. (1970) Symptom patterns in hyperactive, neurotic and normal children. Child Development, 41, 667-682.

Conners , C.K. (1973) Rating scales for use in drug studies with children (Special Issue). Psychopharmacology Bulletin, Pharmocotherapy of children, 24-29.

Conrad, R. (1971) The chronology of the development of covert speech in children. Developmental Psychology, 5, 398-405.

Copeland, A.P. (1979) Types of private speech produced by hyperactive and nonhyperactive boys. Journal of Abnormal Child Psychology, 7, 169-177.

Crowder, R.G. (1984) Is it just reading? Comments on the papers by Mann, Morrison, and Wolford and Fowler. Developmental Review, 4, 48-61.

Diaz, R.M. (1984) The union of thought and language in children's private speech: Recent empirical evidence for Vygotsky's theory. Paper presented at the International Congress of Psychology, Acapulco, Mexico.

Diaz, R.M. & Padilla, K. (1985) The self-regulatory speech of bilingual preschoolers. Paper presented at the Biennial Meetings of the Society for Research in Child Development. Toronto, Canada.

Drillien, C.M. (1972) Aetiology and outcome in low birth weight infants. Developmental Medicine and Child Neurology, 14, 563-574.

Flavell, J.H. (1970) Developmental studies of mediated memory. IN H.W. Reese and L.P. Lipsitt (Eds.), Advances in child development and behavior (Vol. 5). New York: Academic Press, 1970, 181-211. (b)

Frauenglass, M.H. & Diaz, R.M. (1985) Self-regulatory functions of children's private speech: A critical analysis to recent challenges to Vygotsky's theory. Developmental Psychology, 21, 357-364.

Friedling, C. & O'Leary, S.G. (1979) Effects of self-instructional training on second- and third-grade hyperactive children: A failure to replicate. Journal of Applied Behavior Analysis, 12, 211-219.

Gaskill, M.N. (1985) THe effect of private speech on cognitive performance. Unpublished Master Thesis, The University of New Mexico.

Goodman, S.H. (1981) The integration of verbal and motor

behavior in preschool children. Child Development, 52, 280-289.

Graybill, D., Jamison, M. & Swerdlik, M.E. (1984) Remediation of impulsivity in learning disabled children by special resource teachers using verbal self-instruction. Psychology in the Schools, 21, 252-254.

Kendall, P.C. & Braswell, L. (1985) Cognitive-behavioral therapy for impulsive children. New York: The Guilford Press.

Kohlberg, L., Yaeger, J. & Hjertholm, E. (1968) Private speech: Four studies and a review of theories. Child Development, 39, 691-736.

Luria, A.R. (1961) The role of speech in the regulation of normal and abnormal behavior. New York: Liveright Publishing Corporation.

Luria, A.R. (1982) Language and Cognition. New York: John Wiley.

Mann, V.A. (1984) Reading Skill and language skill. Developmental Review, 4, 1-15.

McCarthy, D. (1972) Manual for the McCarthy Scales of Children's Abilities. New York: Psychological Corporation.

Meichenbaum D.H. (1971) The natural modification of impulsive children. Paper presented at the Biennial Meetings of the Society for Research in Child Development.

Meichenbaum, D.H. & Goodman, J. (1971) Training impulsive children to talk to themselves: A means of developing self-control. Journal of Abnormal Psychology, 77, 115-126.

Meichenbaum, D.H. & Goodman, S. (1979) Clinical uses of private speech and critical questions about its study in natural settings. In G. Zivin (Ed.), The development of self-regulation through private speech. New York: John Wiley.

Miller, M. & Rohr, M.E. (1980) Verbal mediation for perceptual deficits in learning disabilities: A review and suggestions. Journal of Learning Disabilities, 13, 33-35.

Milner, E. (1976) CNS maturation and language acquisition. In H. Whitaker & H.A. Whitaker (Eds.), Studies in neurolinguistics (Vol. 1). New York: Academic Press.

Palkes, H., Stewart, M. & Kahana, B. (1968) Porteus Maze performance of hyperactive boys after training in self-directed verbal commands. Child Development, 39, 817-826.

Reid, K.D., Hresko, W.P. & Hammill, D.D. (1981) Manual for the Test of Early Reading Ability. Austin, TX: Pro-Ed.

Salvia, J. & Ysseldyke, J. (1981) Assessment in special and remedial education. Boston, MA: Houghton Mifflin Company.

Satz, P. Taylor, H., Friel, J. & Fletcher, J. (1978) Some developmental and predictive precursorsof reading disabilities: A six year follow-up. In A.L. Benton & D.P. Pearl (Eds.), Dyslexia. New York: Oxfor University Press, pp 313-347.

Sell, E. (1983) School performance of infants who received intensive nursery care. The newborn follow-up newsletter, 6(10).

Solan, H.A., Mozlin, R. & Rumpf, D.A. The relationship of perceptual-motor development to leaarning readiness in Kindergarten: A multivariate analysis. Journal of Learning Disabilities, 18, 337-344.

Vygotsky, L.S. (1962) Thought and Language. Cambridege, MA: MIT Press.

Wolford, G. & Fowler, C.A. (1984) Differential use of partial information by good and poor readers. Developmental Review, 4, 16-35.

Zivin,G. (Ed.) (1979) The development of self-requlation through private speech. New York: John Wiley.

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Table 1

Individual and Group Scores for Cognitive and Behavioral Measures Including Number of Whispers and Whisper Group Classification.

Subject No.	McCarthy Gen. Cognitive Index	TERA Reading Quotient	VMI Standard/Percentile Score	Conners	Total No of Whispers	Whisper @ Group
1	110	84*	6/12%	7	5	LW
2	102	82*	11/62%	20**	17	HW
3	84	55*	6/12%	8	0	LW
4	106	90	9/46%	4	28	HW
5	99	76*	8/31%	2	0	LW
6	94	72*	7/21%	7	12	HW
7	94	98	8/31%	11	7	HW
8	115	84*	12/81%	5	0	LW
9	86	101	7/21%	4	8	HW
10	113	98	10/66%	21**	8	HW
11	89	73	5/9%	17**	19	HW
12	118	72*	8/33%	5	0	LW
13	71	66	3/<1%	19**	1	LW
14	110	85*	6/13%	1	2	LW
15	96	76*	4/4%	16**	6	LW
16	107	85*	13/89%	0	16	HW
Group Mean	99.6	81.0	7.69/33.25%	9.2		
(S.D.)	(12.9)	(12.3)	(2.71)(26.88)	(7.1)		

*Reading disabled (GCI-RDQ $\geq$ 20) **Hyperactive (Conners > 15)

@LW = Low Whisper Group; HW = High Whisper Group

Table 2

Mean Number of Utterances (and Standard Deviations)

for Speech Levels in Easy and Difficult Tasks

Speech Level	Task Difficulty: Easy-Classification	Difficult-Sequencing
High Level (task relevant + whispers)	14.75 (30.15)	42.94 (61.56)
Low Level (task irrelevant + social)	6.25 (17.19)	4.12 (9.40)

Table 3

Means, Standard Deviations and Percentages

for Four Categories of Speech by Mental Age Groups

Speech Type		Mental Age Groups		
		Group 1 ($\overline{MA}$ = 59.0)	Group 2 ($\overline{MA}$ = 72.0)	Group 3 ($\overline{MA}$ = 84.4)
		n=6	n=5	n=5
Task Relevant	Mean	67.0	81.8	16.6
	(SD)	(62.9)	(107.4)	(28.4)
	%	57%	88.3%	78.8%
Task Irrelevant	Mean	5.2	1.6	0.0
	(SD)	(7.8)	(3.6)	(0.0)
	%	4.4%	1.7%	0.0
Whispers	Mean	11.8	6.8	4.8
	(SD)	(11.23)	(3.7)	(7.2)
	%	10.0%	7.3%	22.2%
Social	Mean	33.5	2.4	3.0
	(SD)	(65.7)	(5.4)	(4.2)
	%	28.5%	2.6%	.9%

Table 4

Mean, Standard Deviations and Test of Significance

for Cognitive and Behavior Measures by Low and High Whispers Groups

Measures	Low Whispers Group	High Whispers Group	t value	two-tail p
McCarthy-GCI	100.37	98.87	.22	n.s.
	(16.30)	(9.53)		
TERA-RDQ	74.75	87.37	2.33	<.05
	(10.37)	(11.31)		
VMI-Raw Scores	7.37	10.25	1.95	<.07
	(3.29)	(2.55)		
Conners	7.87	10.5	.72	n.s.
	(6.42)	(8.01)		

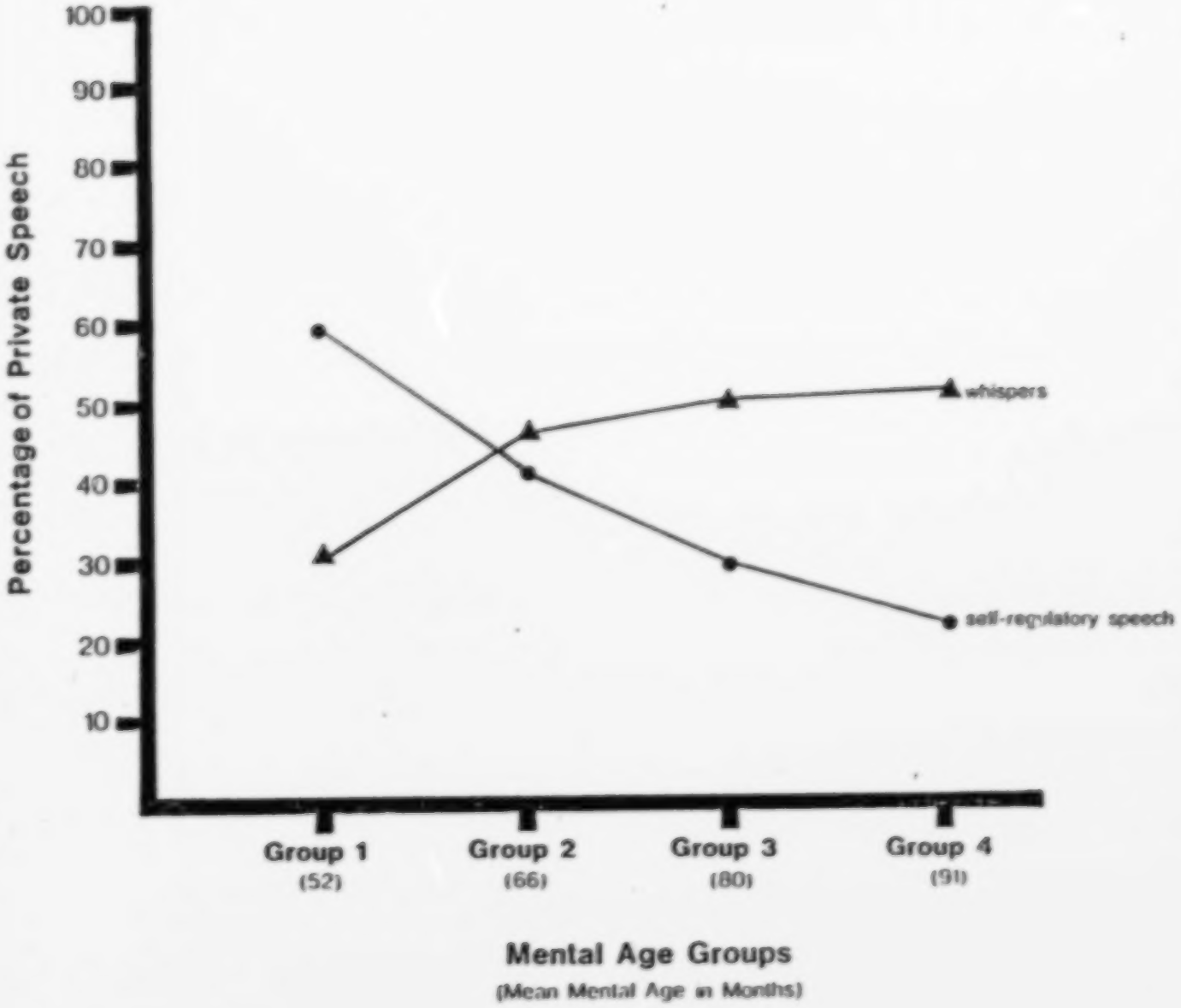
Figure Captions

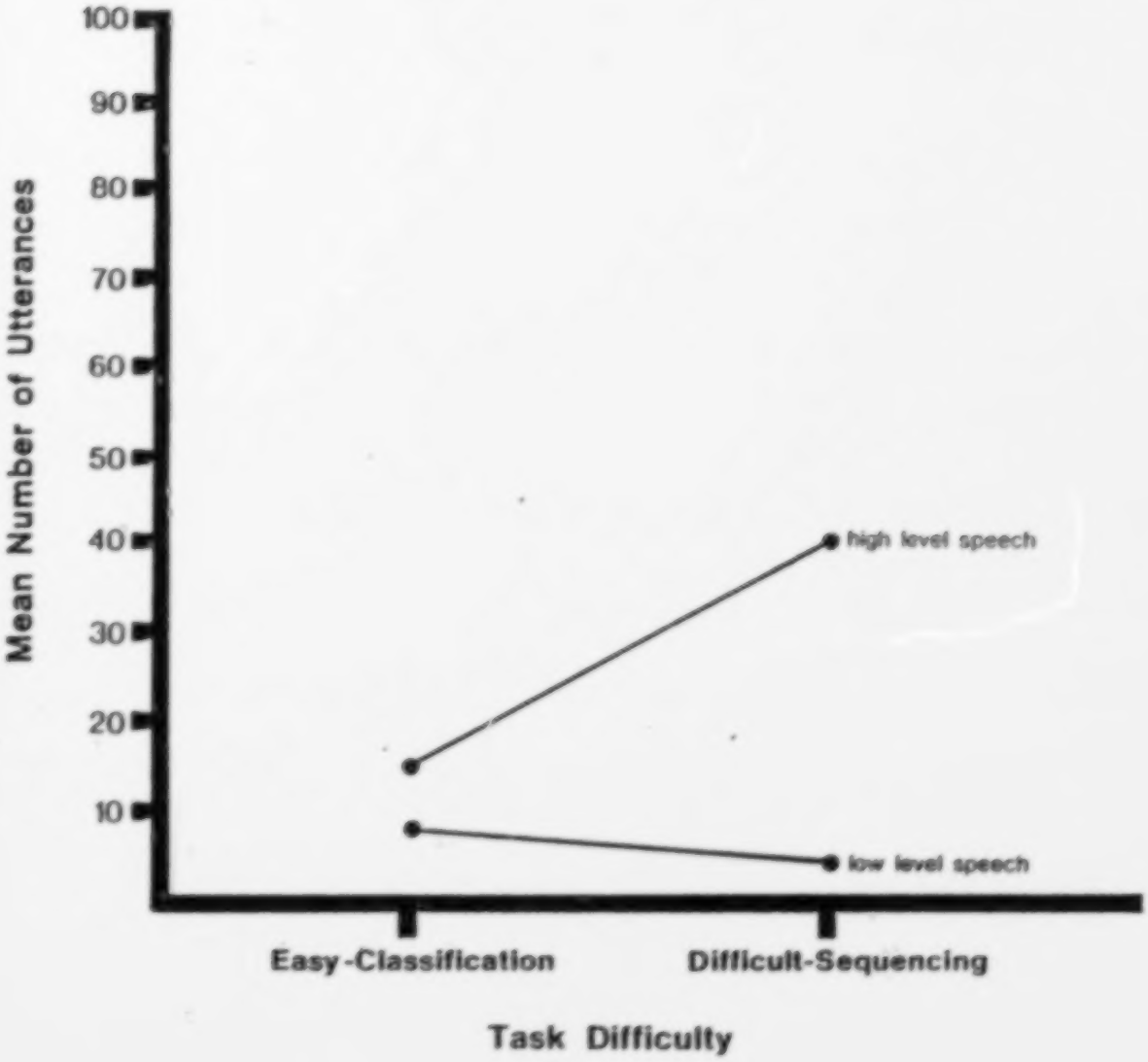
Figure 1. Interaction between whispers and self-regulatory speech with increasing age, found in normal preschool children. Adapted from Frauenglass & Diaz, 1985.

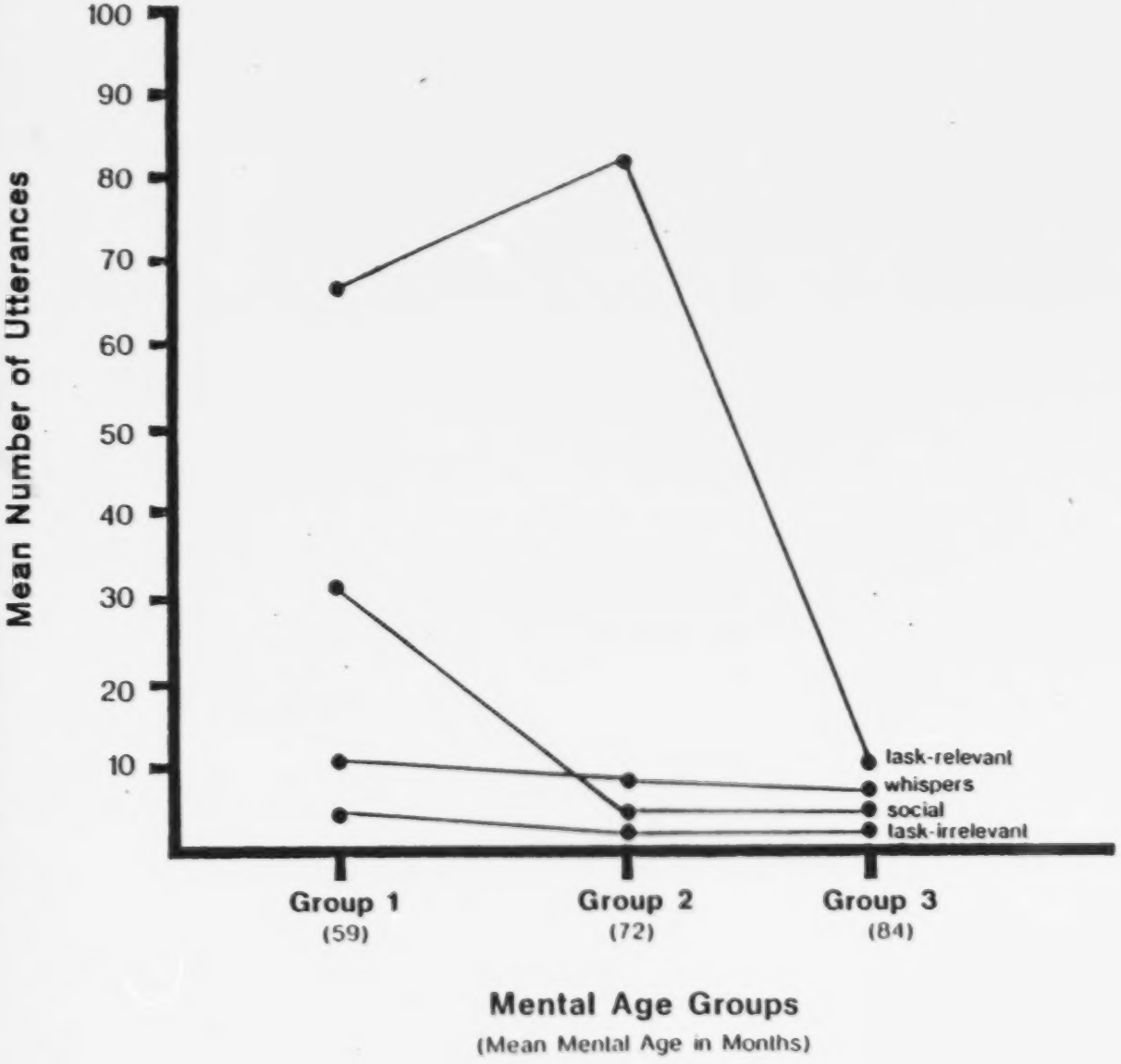
Figure 2. Interaction between speech level and task difficulty.

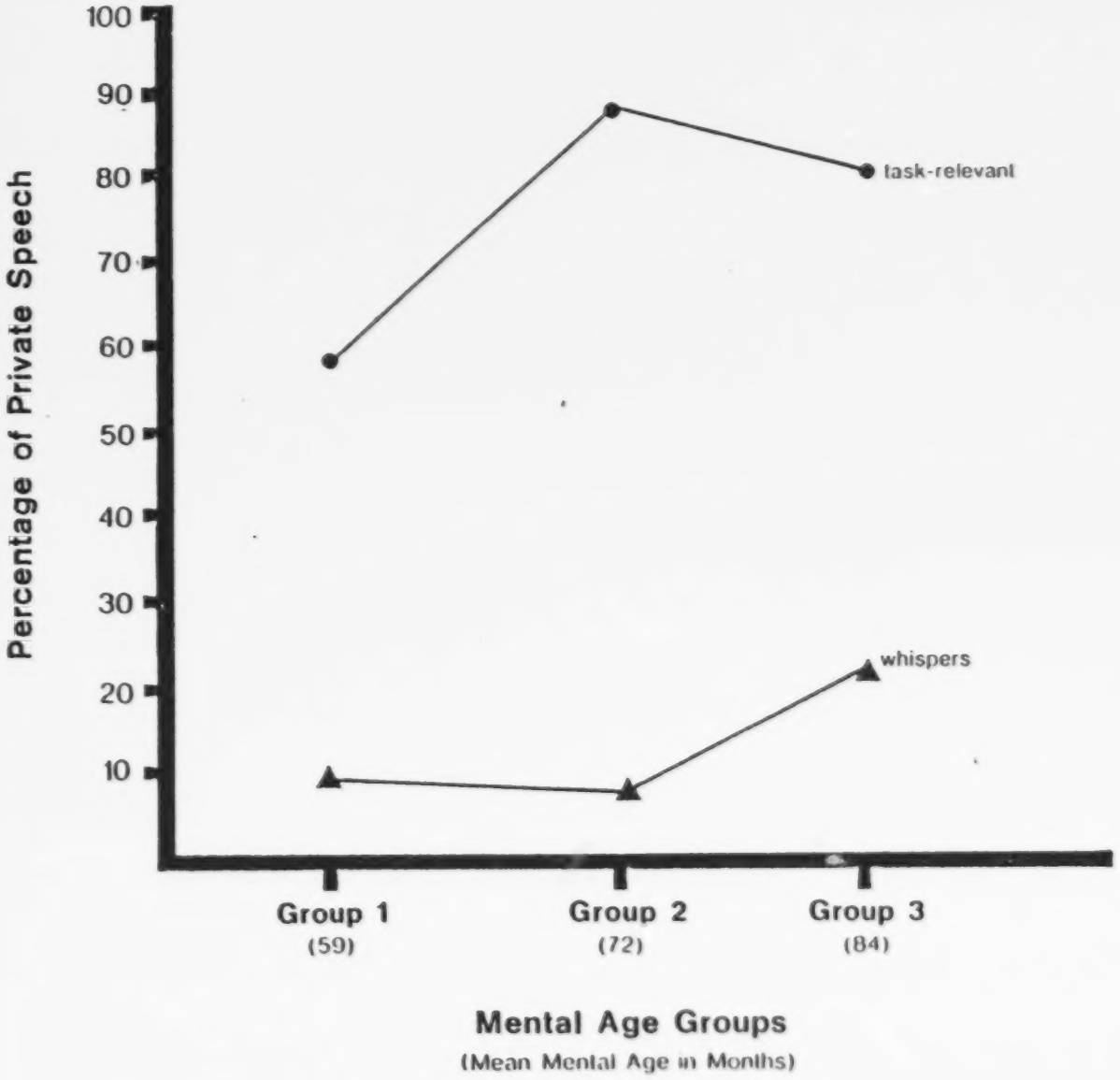
Figure 3. Mean number of speech units emitted by different mental age groups.

Figure 4. Percentage of private speech in task relevant and whispers categories emitted by different mental age groups.


Percentage of Private Speech
100
90
80
70
60
50
40
30
20
10
whispers
self-regulatory speech
Group 1
(52)
Group 2
(66)
Group 3
(80)
Group 4
(91)
Mental Age Groups
(Mean Mental Age in Months)


100
90
80
70
60
50
40
30
20
10
Mean Number of Utterances
high level speech
low level speech
Easy-Classification
Difficult-Sequencing
Task Difficulty


100
90
80
70
60
50
40
30
20
10
Mean Number of Utterances
task-relevant
whispers
social
task-irrelevant
Group 1
(59)
Group 2
(72)
Group 3
(84)
Mental Age Groups
(Mean Mental Age in Months)


100
90
80
70
60
50
40
30
20
10
Percentage of Private Speech
task-relevant
whispers
Group 1
(59)
Group 2
(72)
Group 3
(84)
Mental Age Groups
(Mean Mental Age in Months)